Evaluation of a Pneumatic Cultivator Seeder as a Direct Seeding Implement in Comparison to Other Seeding Equipment

L.A. McLean

In the spring of 1980 Bill Reed of the Agricultural Engineering Department at the University of Saskatchewan, Herman Austenson, Head of the Crop Science Department and myself forwarded a proposal to Prasco which indicated we would like to compare a pneumatic cultivator seeder to other conventional types of seeding equipment. We were interested in evaluating the efficiency of this machine as a direct seeding implement (no prior tillage, into standing stubble). After a favorable response from Prasco a test was established on two stubble crop locations. The Kernen farm, on a heavy Sutherland clay soil, from which a 30+ bushel per acre (2000 kg/ha) crop was harvested in 1979 and the Goodale farm, a Bradwell light loam soil, from which a 25 bushel per acre (1700 kg/ha) crop of Tower rapeseed was harvested in 1979 were chosen as the sites. The stubble height at the Kernen site was approximately 10" (25 cm) in height with snow trap strips 18-20" (45-50 cm) in height left at 40' (12 meter) intervals (strips ran in a North and South direction). The Goodale site had a rapeseed stubble height of approximately 10"(25 cm). Soil test data showed a moderate nutrient status at Kernen (40 lb N/ac (45 kg/ha) top 2 feet) and moderately low status at Goodale (17 lb N/ac (20 kg/ha) top 2 feet).

The test to evaluate the performance was set up as a randomized complete block design at each of the 2 locations with 4 replications using 2 rates of N (100 lb (1125 kg/ha) 28-28-0 and 50 lb (56 kg/ha) 11-55-0) and 6 implement treatments:

1. Noble Hoe drill (modified opener)
2. Haybuster 1206 (loan from Sask. Wheat Pool)
3. IHC Model 420 Press drill with preseed tillage (done as a tandem disc operation the day prior to seeding)
4. JD Model 1900 discer (2x12 tandem)
5. Prasco 35-40 air seeder on MF cultivator with no preseed tillage
6. Prasco 35-40 air seeder on MF cultivator with preseed tillage (as above)

Each plot was approximately 40'x1100' (12m x 330m) at Kernen and 40'x350' (12m x 106m) at Goodale.

Parameters measured in 1980 (only Kernen, Goodale had a very poor emergence and the area was plowed up).

(1) Seeding depth - Each implement was operated at a seeding depth of 2 1/2' (65 cm). To check on our seeding depth accuracy (see Table 1) the seeding depth on each plot was measured.

Table 1. Seeding depth of Implements 1980

Implement	Depth (mm)
Prasco No Tillage	71
Discer	65
Prasco With Tillage	69
Noble hoe drill	65
*Haybuster	42
**Press drill (disc)	39

* as deep as possible into heavy clay
**after rain packed down area.

(2) Seed rate - Calibrations were done on each machine prior to seeding with a seeding rate of 60 lb/acre (67 kg/ha) selected. Emergences were done on two dates before and after a rain on May 30/81 (see Table 2).

Table 2. Plant Emergence (plants/m^2)

Implement	Before Rain	After Rain
Prasco No Tillage	90	158
Discer	82	131
Prasco With Tillage	87	155
Noble Hoe-drill	128	139
Haybuster	51	134
Press drill (disc)	18	140

(3) Yield - grain only (see Table 3)

Table 3. Yield

Implement	Yield (bu/ac)	Yield (kg/ha)
Prasco No Tillage	15.0	1007
Discer	13.8	926
*Prasco With Tillage	11.8	792
Noble Hoe-drill	14.6	980
Haybuster	14.8	991
Press drill (disc)	13.4	898

* 2 of 4 plots lost due to error

NOTE: No grain straw rations were taken in 1981
NOTE: 40% hail on these plots on Sept. 3/81.

(4) Protein content - seed only (see Table 4).

Table 4. Protein Content

Implement	% Protein
Prasco No Tillage	16.9
Discer	16.9
Prasco With Tillage	16.8
Noble Hoe-drill	16.7
Haybuster	16.8
Press drill (disc)	16.4

(5) Wild oat counts.

Table 5. Wild Oat Counts*

Implement	Counts
Prasco No Tillage	1.0
Discer	1.0
Prasco With Tillage	0.9
Noble Hoe-drill	2.0
Haybuster	4.7
Press drill (disc)	4.2

*Visual Rating 0-9

Weather: Extremely dry (Only rain received during the growing season was 6.82 inches) with the majority falling in two rains (May 30, Sept. 3).

Weed Control: Total area sprayed after seeding (4 days) with 6 oz. AI Roundup for control of all weeds.

Total area sprayed on June 16 with 6 oz. AI Torch plus 4 oz. AI24D low volatile.

In general the weed control was very good. A few wild oats appeared in the snow trap strips. A larger number of wild oats were present in the double disc type implement plots (Table 5).

DISCUSSION. In 1980, due to very dry conditions at seeding, any seed bed disturbance resulted in reduced yields (air seeder with preseed tillage and press drill). The other method had no real differences in yield (signif. at .07). There were no differences found in the protein content of the grain and only slight differences in the depth of seeding. A real variation existed in the emergence of the crop prior to the rain on May 30. After that date the emergence tended to even out although the Noble still had the most uniform stand. In operating the air seeder we have a few general comments on the implement from our observations in the field. We feel that there are certain limitations in the implement with respect to the cultivator to which it is attached. We feel that the following are guidelines for selecting a cultivator for the system:

(1) Use of a 3 bar not 4 bar type cultivator i.e. 3 rows of shovels
(2) Walking beams on wheels
(3) Good depth control adjustment on wings
(4) Packing is essential under dry conditions

1981 onward - "drill" evaluation with hopefully newer types of drills and using snow trapping and on two tillage systems (no tillage, fall blading)
- P_2O_5 placement (spring, fall with seed)
- Packing work on air seeder